

**CLAIMS**

What is claimed is:

- 1 1. A dual magnetic tunnel junction head, comprising:  
2 a free layer;  
3 first and second antiparallel (AP) pinned layer structures positioned on opposite  
4 sides of the free layer, each of the AP pinned layer structures including at  
5 least two pinned layers having magnetic moments that are self-pinned  
6 antiparallel to each other, the pinned layers being separated by an AP  
7 coupling layer;  
8 a first barrier layer positioned between the first AP pinned layer structure and the  
9 free layer;  
10 a second barrier layer positioned between the second AP pinned layer structure  
11 and the free layer;  
12 wherein the head does not have an antiferromagnetic layer.
- 1 2. A head as recited in claim 1, wherein the free layer includes a layer of NiFe.
- 1 3. A head as recited in claim 2, wherein the free layer further includes layers of  
2 CoFe sandwiching the layer of NiFe.

- 1 4. A head as recited in claim 1, wherein the AP pinned layer structures have about  
2 the same magnetic thickness.
- 1 5. A head as recited in claim 1, wherein the free layer has a thickness of less than  
2 about 30Å.
- 1 6. A head as recited in claim 1, wherein the free layer has a thickness of between  
2 about 15 and 25Å.
- 1 7. A head as recited in claim 1, wherein a half voltage of the head is more than two  
2 times greater than a half voltage of a head having a substantially similar structure  
3 but having only one barrier layer.
- 1 8. A head as recited in claim 1, wherein the head has a thickness of less than about  
2 500Å.
- 1 9. A head as recited in claim 1, wherein the head has a thickness of less than about  
2 300Å.
- 1 10. A dual magnetic tunnel junction head, comprising:  
2 a free layer having a thickness of less than about 30Å;  
3 first and second antiparallel (AP) pinned layer structures positioned on opposite  
4 sides of the free layer, each of the AP pinned layer structures including at

5           least two pinned layers having magnetic moments that are self-pinned  
6           antiparallel to each other, the pinned layers being separated by an AP  
7           coupling layer;  
8           a first barrier layer positioned between the first AP pinned layer structure and the  
9           free layer;  
10          a second barrier layer positioned between the second AP pinned layer structure  
11          and the free layer;  
12          wherein the head has a thickness of less than about 500Å.

1    11.    A head as recited in claim 10, wherein the free layer includes a layer of NiFe.

1    12.    A head as recited in claim 11, wherein the free layer further includes layers of  
2          CoFe sandwiching the layer of NiFe.

1    13.    A head as recited in claim 10, wherein the AP pinned layer structures have about  
2          the same magnetic thickness.

1    14.    A head as recited in claim 10, wherein the free layer has a thickness of less than  
2          about 30Å.

1    15.    A head as recited in claim 10, wherein the free layer has a thickness of between  
2          about 15 and 25Å.

1 16. A head as recited in claim 10, wherein a half voltage of the head is more than two  
2 times greater than a half voltage of a head having a substantially similar structure  
3 but having only one barrier layer.

1 17. A head as recited in claim 10, wherein the head has a thickness of less than about  
2 300Å.

1 18. A head as recited in claim 10, wherein the head does not have an  
2 antiferromagnetic layer.

1 19. A magnetic storage system, comprising:  
2 magnetic media;  
3 at least one head for reading from and writing to the magnetic media, each head  
4 having:  
5 a sensor having the structure recited in claim 1;  
6 a writer coupled to the sensor;  
7 a slider for supporting the head; and  
8 a control unit coupled to the head for controlling operation of the head.

1 20. A magnetic storage system, comprising:  
2 magnetic media;  
3 at least one head for reading from and writing to the magnetic media, each head  
4 having:

- 5                   a sensor having the structure recited in claim 10;
- 6                   a writer coupled to the sensor;
- 7           a slider for supporting the head; and
- 8           a control unit coupled to the head for controlling operation of the head.